REMARKS

New independent claim 44 has been added to further define the invention. Claim 44 recites a method of modifying the structure of a workpiece, by the controlled formation of numerous features of predetermined geometry using a power beam, wherein each feature is positioned at a predetermined location and wherein each of the numerous features is formed according to the steps 1), 2), and 3), where steps 1) and 2) are the same as those of the corresponding steps of claim 1, and step 3) recites "repeating steps 1) and 2), numerous times, wherein the region which corresponds to each repeat according to step 3) intersects the region of step 1), wherein for each repeat of step 1) the beam travels along a respective beam path having a length of three or more beam diameters, wherein a plurality of intersecting beam paths according to step 3) are used to form the said projection or said hole, wherein for each beam path at least part of the molten material displaced is allowed to solidify before the beam is caused to travel along a subsequent said beam path and wherein for each beam path said at least partial solidifying of said material either adds material to the said projection or removes material from the said hole, so as to form a different geometry or structure of the said projection or hole as a result of the numerous repeats according to step 3). New dependent claim 45 has also been added, and recites a workpiece that has been treated using the method according to claim 44.

The rejection of claim 22 (and the claims which depend therefrom) as being indefinite under 35 USC 112, second paragraph, is respectfully traversed. The claim recites a method of preparing a workpiece in the form of a member, for joining to one or

more further workpieces comprising forming a multiplicity of holes in the surface and/or bulk of the member, and then using the method defined by claim 1 to form outward projections from the member surface. Why is this indefinite? It is respectively submitted that the scope of what is being claimed is clear from the existing recitation, so an objection based on indefiniteness is not warranted. However, if the Examiner, after considering this argument, points out why the claim is indefinite, Applicant will redraft the claim to facilitate the prosecution.

Claims 1-35, 37-40, 42, and 43 stand rejected, under 35 USC 103(a) as being upatentable over U.S. Patent 4,861,407 of Volkmann et al. taken in view of U.S. Patent 6,919,162 of Brennan et al. and in view of JP411044307A. Applicant respectfully traverses this rejection and requests reconsideration.

The primary citation, Volkmann '407, discloses a method for bonding a first body to a second body, and for pretreating the first body by placing it in the path of an energy beam. The first body is placed in the path of a beam having a selected energy density for a duration effective to form projections on the metallic substrate of the first body, the projections being formed by evaporation and/or melting of the metallic substrate, substantially all of the projections being less than 20 micrometers in height (see e.g. col. 2 line 62 through col. 3, line 2, or col. 3, lines 41-48 of the citation). Volkmann et al. indicate, at column 5, that "as long as the energy density for treating the surface is maintained, the relative movement between the laser beam path and the surface to be treated can be as fast as possible," and that preferably, "each area treated overlaps just a little with the area treated previously so that 100% treatment results" (col. 5, lines 36-

41).

As Applicant has previously noted, the cited prior art discloses the use of power beams to roughen a surface. The background portion of Applicant's specification acknowledges the existence of these types of techniques in the prior art (see e.g. page 2 thereof, and references to "surface texturing," etc.). In contrast, the present invention involves a very different technique that results in the formation of special structures that are more complex and larger than are possible with techniques of the prior art.

The Volkmann '407 citation has been applied, first alone, and now together with other citations, throughout the prosecution, and the Examiner is respectfully asked to take a fresh look at the Volkmann reference as it relates (or fails to relate, as the case may be) to the claims presently in the Application.

With reference to the claim 1 rejection, the Examiner states that the Abstract of Volkmann teaches the "pretreatment of a workpiece using an energy beam to form projections on a surface." A reference is then made by the Examiner to a "back and forth" translation (more on this below). Attention then turns to the secondary citations. Upon carefully reviewing the rejection based on Volkmann, Applicant observes that absent from the rejections issued with respect to Volkmann are specific showings of:

(a) where, in Volkmann, there is a disclosure of a first region formed using the power beam, in which, due to melting of the material a projection is formed at a first location and a hole at a different location (step 1 of claim 1);

(b) where, in Volkmann, there is a disclosure of any, let alone "numerous", additional regions each of which also have a projection at one location and a hole at a

different location (step 3 of claim 1); and

(c) where, in Volkmann, there is interaction of the regions of (a) and (b) so that either (or indeed each) of the projection or hole are increased in size with respect to the size of the respective projection or hole after step 1.

Applicant respectfully submits that neither (a), nor (b), nor (c) is taught either explicitly or implicitly by Volkmann. Whilst the examiner refers to an "overlap" this simply does not fulfill the requirement of step (3) of claim 1. A suggestion that Volkmann forms projections and involves an overlap, falls far short of the limitations according to claim 1. The features of the steps summarized in (a), (b), (c) above demonstrate that this is the case. Volkmann does not provide any synergy between a first step and any subsequent step, and there is certainly no disclosure of the intersection of regions (each of which are required to have a hole and projection, as defined in claim 1, due to steps 1 and 3) so that a projection and/or a hole are increased in size.

In Volkmann, the shape of the power beam profile at the point of interaction with the substrate is a line image (e.g. 1/2 inch across – see column 10, line 64). This is then moved across the substrate to treat the surface. The beam translation speed varies between the examples, although it is typically about ¼ to ¾ inch per second. Notably the pulse time is of the order of nanoseconds or microseconds. Thus, given a pulse rate of 30 per second (e.g. column 10, line 56), it will be understood that there is no appreciable beam translation whilst the beam is interacting with the surface. Thus Volkmann does not in truth disclose a beam path as used in the invention. The

Examiner will understand that the surface physics used by the present invention requires the beam to be "on" during the movement so as to generate a molten region, and it is this movement which causes the formation of the projection and the hole at different parts of the beam path ("region"). Without such movement the effect does not occur. At best, Volkmann only generates an elongate (line) melted region for each pulse and it is important to understand that all locations along the line are melted on this path at the same time (simultaneously). Thus, the projection and hole effect of the present invention cannot occur in Volkmann because there is no appreciable translation of the beam whilst it is "on". Since there is no beam path, it follows that there is no intersection of such beam paths. The reference to an "overlap" to which the Examiner refers is due to the use of a defocused beam which simultaneously treats a larger area. However, again there is no appreciable movement whilst the beam is "on" – indeed even less so since any microscopic movement during the beam translation is therefore even smaller in comparison with the beam cross-section.

For these reasons the Examiner is respectfully asked to review the claims of the present application once more in the light of the primary citation, Volkmann, as it should now be clear that Volkmann does not actually disclose all it is cited for.

The secondary citations do not provide the teachings missing from the primary citation.

The Examiner relies upon Brennen as disclosing a method of ablating features where the ablation is repeatedly offset and performed again in an overlap manner. It can be noted initially that the part of the document referred to (spanning columns 3 and

4) is in fact a discussion of conventional methods of laser mask fabrication. All this section is teaching is that a laser beam may be impinged upon a location to cause ablation at that location and then this process may be repeated by moving the laser to another nearby location and again ablating material. This is analogous to using a drill bit to cut a first hole in a substrate, withdrawing the drill and moving it slightly and then cutting another hole nearby which may overlap with the first. The Examiner moves on to suggest that the section in column 12 between lines 36 and 43 is relevant in that it discloses step-and-repeat methods using a predefined laser spot to generate features such as different shapes. However, all this is actually disclosing is the fact that a laser beam may be used to cut an extensive hole for a particular shape within a material.

Given the discussion above, it will be appreciated that this teaching of Brennan has very little to do with the present invention. Indeed, Applicant disputes whether one of ordinary skill in the art would consider this document anyway when considering the teaching of Volkmann. In truth, Brennen simply discloses the use of an ablation process and of course the Examiner will understand that the term "ablation" means that the material from the hole is ejected entirely away from the substrate. [The dictionary indicates that the root of the word "ablation" (from the Latin) is "carried away".] In contradistinction, in Applicant's claimed invention, ablation is entirely contrary to what is desired. The present invention requires the melting of the material within the region and its movement within the region so as to form the projection and hole for each of the step 1 and (repeated) step 3. Since Brennen is concerned with an ablation process, the person of ordinary skill in the art is simply not motivated to refer to this document. It

will be further understood that even if the teachings of Brennen and Volkmann were combined (which we strongly dispute), there is no teaching of either of the features (a), (b), and as set out above, in either Volkmann or Brennen. Neither Volkmann nor Brennan, alone or together, builds structure using repeated melting, at least partial solidifying, and remelting, much less in the detailed manner set forth in Applicant's claims.

With further reference to the Examiner's objection relating to claim 1, the Examiner cites JP 411044307A. A machine translation of this document is provided for reference. It is quite clear that JP'307 teaches even less to the person of ordinary skill in the art than Brennen. The disclosure of JP'307 is rather limited and teaches little more than the use of a method which involves a laser to produce a resultant structure in the form of a projection such as a mushroom shape. It is entirely unclear how this method is actually performed. However, what is clear is that there is no disclosure of movement of a power beam within a region so as to melt material nor, due to surface physics, to cause the material to form a projection and a hole in the region, await at least partial solidification and then the formation of further regions, each with a projection and hole, and the use of these projections/holes in combination so as to form either or each of a projection and hole of increased size. Whilst we submit that JP'307 teaches nothing to allow a person of ordinary skill in the art to arrive at the invention given the teaching of Volkmann, we believe, as for Brennen, there would be no motivation for a person of ordinary skill in the art to combine the teachings of these documents, and not least since different laser methods are used.

Thus, in summary of Applicant's response to the rejection based on Volkmann and secondary citations, Applicant remains of the opinion that Volkmann is far less relevant to the independent claim 1 even if its disclosures could be combined with the secondary references (which is strongly disputed in any case). Applicant therefore cordially requests that the Examiner reviews this matter once more and in particular the distinguishing features set out at (a), (b), (c) above with reference to Volkmann.

As first noted above, an additional independent claim 44 has been presented for further consideration. This claim includes further limitations in scope for example due to the requirement of a beam path having a length of at least 3 beam diameters and specifically requiring that material is either added to the projection or is removed from the hole so as to form a different geometry as a result of the repeated step 3.

Turning now to the other rejection of independent claim 1, the Examiner relies on Clarke (US 6176959) as the primary reference. Clarke is a very short document which is somewhat dominated by the single figure. However, the figure is entirely unrepresentative of the structure formed by the process described. In particular we note at column 2 line 45 that the microtexturised surface has cellular depressions and whisker-like projections of a size of about 75 to about 125 Angstroms. This size is about two orders of magnitude smaller than optical resolution and therefore this structure is absolutely minute. To place this in context, the structures disclosed in some of the examples within the present application are about one million times larger in height. That aside, returning to Clarke, the structure shown in Figure 1 is somewhat misleading. We believe the Examiner has assumed that each of the projections and

depressions is formed by an individual laser step process. However, it should be noted that Clarke does not make any such suggestion and indeed the scale of the structures would mean that their individual formation would not be achievable using a laser in this way. The repetition of the process discussed in column 3 is merely to achieve surface coverage by relative movement between the power beam and the substrate. However, from the earlier discussion of Volkmann, the Examiner will appreciate that there is a distinction between laser processes such as Clarke and Volkmann which involve translation between the beam and the substrate, and the process claimed in the independent claim 1 of the present application. It will be understood from the discussion earlier, that, as was the case for Volkmann, in Clarke there is no melted region which exists so as to cause a projection in one part of the region and a hole in another part of the region. Clarke therefore does not attempt to cause an overlap of such molten regions so as to increase the magnitude of a projection or hole. Applicant also notes that the "projection" and "depression" of Clarke should not be assumed to be analogous to the projection and hole respectively of the present invention, not least since in Clarke these are not part of the same region and are not a result of surface physics involving the movement of molten material.

Thus Clarke is of less relevance even than Volkmann.

The Examiner again refers to Brennen and JP'307, for combination with Clarke. Applicant notes that no additional argumentation is provided, nor is such argumentation specific to the difference between Clarke and Volkmann. Nevertheless, Applicant's above comments in respect of Brennan and JP'307 apply with respect to Clarke also,

namely in that these processes are not related to that of Clarke and nor would a person of ordinary skill in the art be motivated to combine the teachings. It will further be appreciated that even if the skilled person were motivated to combine Clarke with Brennen or JP'307 then again, as for Volkmann, the fundamental process on which the invention relies is not disclosed in any of these documents and therefore the independent claim 1 must not be obvious. As a further reason why Clarke would not be combined with Brennen or JP'307, one can simply refer to the relative magnitude of the structures in these documents. Whilst we trust that it is now clear why independent claim 1 is novel and not obvious over the cited prior art, we commend claim 44 to the Examiner also, for similar reasons as mentioned earlier.

The Office Action also cites new documents JP62006449A, Scott, Montfort et al. and Goruganthu et al. against various dependent claims. These citations have been reviewed and none of then provide the teachings missing from the citations applied against the broader claims, as previously treated.

The foregoing should be completely dispositive of the issues in the Application, but, if necessary, Applicant respectfully asks the Examiner to consider one further aspect of the prosecution of this Application, as follows:

During the prior prosecution the Examiner has referenced col. 14, lines 36-40 of Volkmann et al. which is part of Volkmann's Example 6, and states:

> "The panels are translated back and forth through the laser beam at 12 mm/sec to completely treat one side of each panel with about a 150 percent overlap of each pulse treated area."

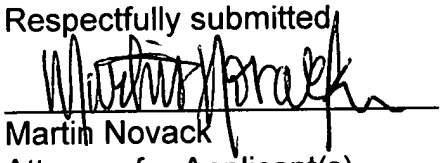
At that time, Volkmann was being applied by the Examiner alone (with no combined secondary citation) as a basis for obviousness under 35 USC 103. The Examiner had argued at that time that Volkmann describes "back and forth translation in order to overlap the treatment of a pulse treated area by 150 percent." Applicant argued, in response (both in written response, and in telephonic interview with the Examiner), that this was a misinterpretation of Volkmann et al. As was discussed with the Examiner, the reference in Volkmann to translation "back and forth" pertains to getting complete treatment of a side of a panel being treated and does not pertain to going back and forth over individual pulse treated areas. During said discussion, the Examiner did not disagree with this point, and Counsel thought that this was a settled point (not to be confused with an agreement regarding patentability, on which the Examiner clearly expressed that he was reserving decision, and might do more searching). In the present Office Action, the Examiner again refers to "back and forth translation in order to overlap the treatment of a pulse treated area by 150 percent."

Thus, on the one hand, the Examiner's position seems contrary to what was believed to be a settled point regarding Volkmann, and it is respectively asked that if the Examiner has decided to persist with this argument, that he support the position by showing where in Volkmann there is any teaching whatsoever that the "back and forth" of Volkmann (which is specifically stated by Volkmann to be "to completely treat one side of the panel" - bearing in mind that the "150 percent overlap" was already explained earlier in Volkmann, in col. 5, as "just a little" overlap of each area treated) was for the purpose of going back and forth over individual pulse treated areas.

Applicant does not believe it is possible to rationally support such a position. On the other hand, though, the Examiner appears to have, at least tacitly, accepted Applicant's position on this point since, in the present Office Action, Volkmann is no longer applied alone, and secondary citations (Brennan, etc.) are deemed necessary to purportedly provide a teaching of the repetitive operation of step (3) of claim 1. This being the case, for the reasons enumerated in detail above, the secondary citations have been demonstrated to be inadequate to render the claimed invention obvious. Also, the arguments first set forth above regarding features (a), (b) and (c), further add to the basis for a finding of patentability. Taken together, these two fundamental arguments are believed to constitute an unassailable position for the allowability of the claims.

In view of the foregoing, it is believed that all claims of this application are now in condition for allowance, and such favorable action is respectfully solicited. In the event there are any remaining issues, however, it is asked that the Examiner kindly telephone the undersigned counsel collect so that they can be resolved.

Respectfully submitted,



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(R-24)

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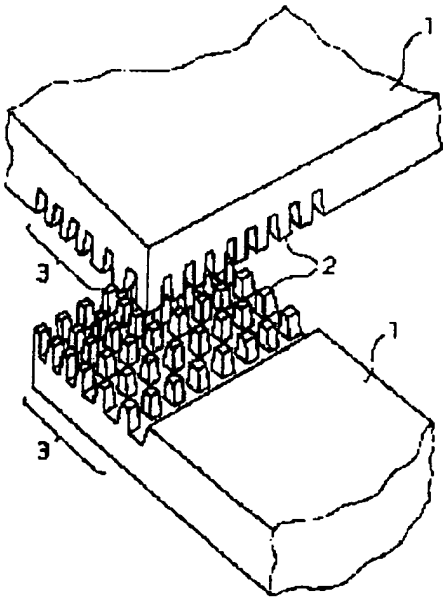
(54) ASSEMBLING METHOD FOR DEVICE AND ASSEMBLED DEVICE



(57)Abstract:
PROBLEM TO BE SOLVED: To facilitate assembling of a device, weight reduction and dismantling after the use by forming one part of a constituting member into a fixing part A on which projections are two-dimensionally arranged and one part of the other constituting member into a fixing part B on which projections are two- dimensionally arranged, and engaging the fixing parts A, B with each other.
SOLUTION: A part 3 in which projections 2 are two-dimensionally arranged is formed on one part of one side of an ABS resin plate 1 having thickness of 3 mm. The projections 2 are arranged at equal intervals of 500 μm pitch in the X-Y directions, the part 3 is manufactured by a photolitho-etching method, a laser grinding method, and the projection 2 is formed into a mushroom shape, a loop shape, with depth of 1-5 mm. A pair of the constituting members are pressure fitted to each other at the parts 3, and the members are joined and fixed with each other. As for the material of the member, polyethylene, other resins, metal, wood can be used, and the material itself preferably has flexibility. Hereby assembling of the device is easy, the weight is light, volatile organic substance is not generated in the case of not using an adhesive, and dismantling is easy at disposing the device.

CLAIMS

[Claim(s)]
[Claim 1]An assembly method of apparatus assembling by using a part of members forming as the holding part A which arranged a projection to two dimensions, using a part of other members forming as the holding part B which arranged a projection to two dimensions, and making said holding parts A and B engaged.
[Claim 2]Apparatus which a part of members forming is the holding part A which arranged a projection to two dimensions, and a part of other members forming is the holding parts B which arranged a projection to two dimensions, and is characterized by being assembled by being made for said holding parts A and B to be engaged.

[Claim 3]An assembly method of apparatus assembling said members forming by adhering to one side the holddown member A which arranged a projection to two dimensions, adhering to a part of other members forming the holddown member B which arranged a projection to two dimensions at one side, and making said holddown members A and B engage with a part of members forming.
[Claim 4]Apparatus, wherein said members forming is assembled by the holddown member A which arranged a projection to two dimensions adhering to one side, and the holddown member B which arranged a projection to two dimensions at one side adhering to a part of other members forming, and making said holddown members A and B engage with a part of members forming.
[Claim 5]The apparatus according to claim 2 or 4 consisting of material of said holding part, or material in which said holddown member was chosen from resin, metal, wood, ceramics, glass, and rubber.
[Claim 6]The apparatus according to claim 2 or 4 being material of said holding part, or the material in which said holddown member has flexibility.
[Claim 7]The apparatus according to claim 4, wherein said holddown member adheres to a part of members forming by one method of adhesion by adhesives, screw fastening, a nail, and a caulking.
[Claim 8]The apparatus according to claim 2, wherein said holding part A and the holding part B are engaging with both sides via the holddown member C which arranged a projection to two dimensions.
[Claim 9]said projection -- a mushroom -- the apparatus according to claim 2 or 4 consisting of any one or more shape of **, looped shape, the shape of a key, and the mountain shape.
[Claim 10]An assembly method of the apparatus according to claim 1 or 3 carrying out the melting unification of the materials of said engagement part by heating said engagement part after making said holding parts A and B or the holddown members A and B engaged.

DETAILED DESCRIPTION

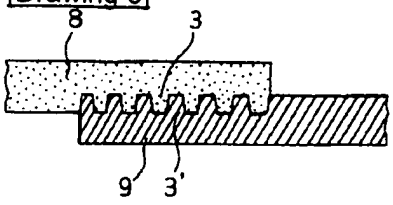
[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to configuration equipment, such as an electric appliance, a business machine, furniture, and a house, and an assembly is easy for it and it relates to apparatus excellent in the abandonment decomposition after use, and recycling efficiency.
[0002]
[Description of the Prior Art]Electric appliances, such as television and a refrigerator, are assembling members forming for the members forming of resin or metal by methods, such as adhesion, a screw stop, and caulking. In these apparatus, in order to make intensity of the assembled members forming high, many screws were used, members forming is joined or members forming is firmly combined with adhesives.
[0003]
[Problem(s) to be Solved by the Invention]For this reason, the assembly operation of apparatus becomes complicated, the weight of apparatus becomes heavy, and the technical problem of VOC generated from adhesives is also produced. When discarding after using such apparatus, decomposition of members forming takes time and effort dramatically, and there are many problems also from a viewpoint of recycling of members forming.
[0004]This invention makes the assembly of apparatus easy, attains the safety from a weight saving, VOC (volatile organic substance), etc. of apparatus, and makes profitably like the apparatus which made the apparatus after use easy to disassemble and was excellent also in the recycling efficiency of a component.
[0005]
[Means for Solving the Problem]This invention is apparatus assembling by aiming at solving an aforementioned problem, using a part of members forming as the holding part A which arranged a projection to two dimensions, using a part of other members forming as the holding part B which arranged a projection to two dimensions, and making said holding parts A and B engaged.
[0006]It is apparatus assembling said members forming by adhering to one side the holddown member A which arranged a projection to two dimensions, adhering to a part of other members forming the holddown member B which arranged a projection to two dimensions at one side, and making said holddown members A and B engage with a part of members forming.
[0007]
[Embodiment of the Invention]Next, the concrete embodiment of this invention is described.
(Embodiment 1) Drawing 1 is an enlarged drawing of the joined part of the apparatus in the embodiment of the invention 1. The portion 3 which arranged the projection 2 to two dimensions is built on a part of one side of the 3-mm-thick ABS-plastics board 1. The projection 2 is arranged at equal intervals in the direction of X-Y in a 500-micrometer pitch. Creation of the portion 3 is performed by photolitho etching method, the laser grinding method, the Stamping method, etc. although drawing 2 is an example of the shape of a projection -- a mushroom -- it consists of shape, such as ** 4, the looped shape 5, the shape of a key 6, and the mountain shape 7. The depth is 1 mm - about 5 mm. As shape of this portion, shape, such as "Dual Lock" by U.S. 3M company and "Scotchmate", can be used, for example. The members forming 8 and 9 of a couple is stuck by pressure in the portions 3 and 3 like drawing 3, and junction immobilization of the members forming is carried out.
[0008]Although drawing 4 shows the example used for the members forming of television, it can use the coupling member of this embodiment for the peripheral parts 10 and 11 of ******.

(Embodiment 2) Drawing 5 shows the embodiment of the invention 2. The holddown member 14 made from ABS which arranged the projection 13 to two dimensions is fixed to a part of surface of the ABS-plastics board 12 via the adhesives layer 15 at one side. The ABS-plastics board 19 which has arranged the holddown member 18 made from ABS similarly fixed via the adhesives layer 17 is produced. The ABS-plastics boards 12 and 19 are joined by sticking the projection 20 and said projection 13 by pressure.
(Embodiment 3) Drawing 6 shows the embodiment of the invention 3. The two-dimensional-array layers 22 and 23 of a 0.5-mm-deep projection are produced with a micro replica method to both sides of the ABS-plastics board (3 mm in thickness, 5 mm x 5 mm) 21, and it is considered as the holddown member 24. On both sides of said holddown member 24, it is stuck by pressure between the projection formed parts 3 of the two ABS-plastics boards 8 and 9 used by Embodiment 1, and 3' part, and ABS-plastics boards are joined.
(Embodiment-4) As shown in drawing 7, irradiate the bond part 27 of the two ABS-plastics boards 25 and 26 united by the same method as Embodiment 1 with a laser beam, carry out partial heating and the holding part 28 and the holding part 29 are made to weld, and it unifies and carries out like 30.
[0009]Although ABS plastics were mentioned as the example and explained as a material of the holddown member of an above embodiment, it is also possible to use other resin and materials further selected from metal, wood, ceramics, glass, and rubber, such as polyethylene, nylon, and PTFE. It is preferred that the material itself has flexibility at this time.
[0010]Although the holddown member illustrated adhesion by adhesives, it is also possible to adhere a holddown member to a part of members forming by one method of screw fastening, a nail, and caulking.
[0011]If the shape of a projection has the so-called function of the "mechanical fastener" mechanically combined also except the thing shown by the above-mentioned embodiment, it will be among the ranges of this invention altogether.
[0012]Although television was explained as an embodiment of apparatus, deployment application of the thought of this invention can be carried out at the apparatus of various fields, such as business machines, such as electrical household appliances and electrical equipment, such as a refrigerator, a washing machine, and an air-conditioner, and a personal computer, and also furniture, and members forming of a house.
[0013]
[Effect of the Invention]According to this invention, assembly production of apparatus becomes easy, the weight of apparatus becomes light, when not using adhesives, and generating of VOC is lost and apparatus is discarded, demolition of apparatus becomes easy, and demolition recycling of apparatus becomes very easy.
[0014]The effect of the temporary stop of the members forming at the time of an assembly is also expectable.
[0015]As mentioned above, this invention is an industrial very effective invention from a viewpoint of LCA and the reverse factory of a product from the assembly of apparatus to disposal recycling.

[Brief Description of the Drawings]
[Drawing 1]The enlarged drawing of the example of the joined part of this invention
[Drawing 2]The figure showing the example of the shape of the projection of this invention
[Drawing 3]The mimetic diagram of the holding part of the members forming of a couple
[Drawing 4]The general-view figure showing the example which used this invention for television
[Drawing 5]The joint mimetic diagram of other embodiments of this invention
[Drawing 6]The joint mimetic diagram of other embodiments of this invention
[Drawing 7]The joint mimetic diagram of other embodiments of this invention
[Description of Notations]
1) ABS-plastics board
2) Projection
3) The portion which arranged the projection to two dimensions
4) a mushroom -- the mimetic diagram of the projection of shape
5) The mimetic diagram of a looped shape projection
6) The mimetic diagram of a key-shaped projection
7) The mimetic diagram of a Yamagata-like projection
Members forming of 8) and nine couples

DRAWINGS

[Drawing 3]



[Drawing 4]

Formation of ``intrinsic'' surface defects during 248 nm photoablation of polyimide

J. Appl. Phys. 73, 3001 (1993); DOI:10.1063/1.353032
Issue Date: 15 March 1993

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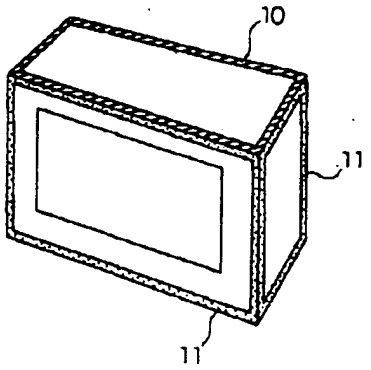
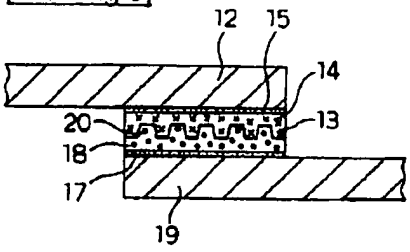
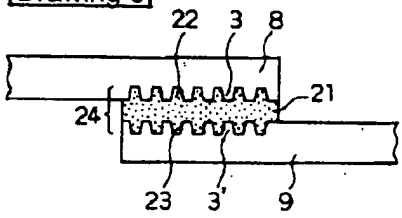
Photoablation of polymers by pulsed excimer laser radiation is commonly believed to be a controlled layer-by-layer removal process. A mass spectrometer was used to monitor neutral species ejected from polyimide samples in vacuum by 248 nm laser radiation. For fluences close to threshold, the ablation rate starts to drop after the first 100–200 pulses and eventually falls almost to zero. The falloff in etch rate is accompanied by a dramatic slowdown in the product translational energy distributions and by the appearance of conical defects on the sample surface. The number of cones is approximately the same for samples irradiated in air or vacuum for the same number of pulses, proving that ablation debris is not the initiating factor. It is argued that carbon enrichment at the sample surface initiates cone formation by locally shifting the ablation threshold to higher values. In effect, the polymer surface becomes ``radiation hardened.''



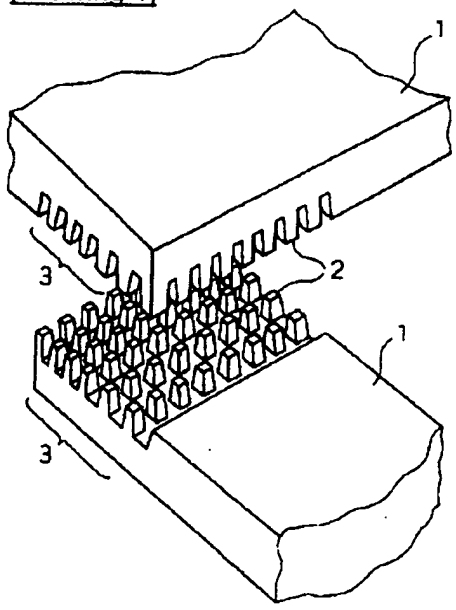
[Drawing 5]



[Drawing 6]



[Drawing 1]



1：ＡＢＳ樹脂板

2：突起物

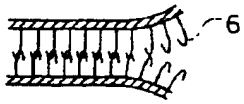
3：突起物を二次元に配列した部分

[Drawing 2]

(a) 直状

(b) ループ状

(c) 扇状



(d) 山状

[Drawing 7]